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(54) **WEAVING FRAME AND METHOD FOR BOBBIN CHANGING**

WEBSPULENGATTER UND SPULENWECHSELVERFAHREN

BATI DE METIER A TISSER ET PROCEDE POUR LE CHANGEMENT DE BOBINES

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Description

[0001] This invention relates to a detachable weaving frame that can be at least partly replaced on a continuously operating weaving machine without causing any interruption or any disturbance to the warp thread tension in the weaving zone.

[0002] Weaving frames are especially utilized in Jacquard weaving machines whereby each individual warp thread has a different yarn consumption during weaving. These weaving frames are disposed behind Jacquard weaving machines and are suited for carrying a large number of cross-wound spools or bobbins. This number corresponds to the total number of warp threads that are necessary for weaving pattern designs in different colors.

[0003] In the course of this text depth direction refers to warp direction, and width direction to weft direction.

[0004] In literature on the subject weaving frames are known that consist of a series of doors which extend in the depth direction and of which a number are disposed next to each other in the width direction of the weaving machine. Each weaving frame door is provided on both sides in height and depth with horizontal supporting spindles and thread guiding spindles. The bobbins are usually wound on a cardboard sleeve. This sleeve is placed on a cylindrical plastic sleeve, which is rotatable on the supporting spindle of the weaving frame. The bobbins can also be wound directly onto a plastic sleeve, so that they can be placed on the supporting spindle without additional plastic sleeve. The placing or changing of the bobbins in a weaving frame is carried out by a bobbin loader. For that purpose a passage is provided between each door of a weaving frame. The doors of a weaving frame can also be made rotatable or moveable.

[0005] From the bobbins that are placed in the weaving frame, the warp thread is pulled off (unwound) sideways and tangentially over the periphery. The pulled-off warp thread is first passed over a higher reversing guiding spindle located more toward the back and then brought back forward over the higher and forward lying reversing spindle of the forward lying bobbin. The warp threads run forward in the frame, into the throughput reed and the entrance grating, in order finally to come into the weaving zone of the weaving machine.

[0006] In order to exert a certain tension on the warp threads a first clamp or trammel is hung over the warp thread loop between the rear reversing guiding spindle and the bobbin in order to slow down the bobbin. A second clamp is hung between the front reversing guiding spindle and bobbin in order to pull back the warp thread out of the weaving zone. These two clamps or trammels that are hung on the warp thread together with the pulled-off loop form a type of band brake over the bobbin and thus establish a certain tension in the warp thread and also prevent the bobbin from unwinding on its own. The front clamp moreover also pulls the warp thread back out of the weaving zone. Hence the terms warp tensioning and pulling-back device of the weaving frame. With the known weaving frames this double function is exerted on and with the bobbin. This warp tensioning and pulling-back device is especially important with pile weaving machines for obtaining a uniform pile height and in order to make possible the interweaving of warp threads, which can take on more than two positions in the weaving shed.

[0007] When a Jacquard weaving machine has to be completely changed over to other weaving colors, the weaving machine is stopped in order to take all the bobbins out of the frame manually and in order to place new bobbins in the frame. This operation is labor-intensive and stopping the weaving machine signifies a certain production loss, with the result that the total output of the weaving machine will decrease the more color changes are performed.

[0008] Bobbin changes for the maintenance of a weaving frame or for changing certain neighboring pile warp threads can be performed on an operating weaving machine. The bobbin loader must moreover still work cautiously. Firstly both clamps or trammels have to be hung on the respective thread guiding spindle. Then the almost empty bobbin is taken off and the new bobbin is placed on the supporting spindle. A secure knot must be tied in order to connect the old warp thread to the new one and the remaining ends of the knot have to be cut off. Finally the clamps or trammels must be correctly placed and the warp thread must again be brought under tension by a small winding-up of the bobbin by a manual rotating movement. During the whole of the preceding operation the tension of the warp thread should not become too slack in order to avoid the thread keeper from coming into operation and thus interrupting the weaving process. The tension may also not be too great or the warp thread will no longer fall into the lower position of the shed in the weaving zone so that in-weaving in the fabric becomes impossible and a so-called tension occurs. With pile weave this leads to a pulling closed of the fabric and a hole develops there after cutting through.

[0009] The weight of the bobbins that can be placed in a weaving frame is limited by the physical load capacity of the bobbin loader. In practical weaving this weight will not exceed 4 kg.

[0010] A device as described in BE no. 9500426 already offers the advantage that clamps or trammels are no longer necessary for maintaining the warp threads under tension and pulling them back out of the weaving zone. This device makes the replacement of a bobbin easier, but during the tying-together the tension on the warp thread between bobbin and recovery/tensioning device remains uncontrolled for a time and there are therefore possible causes of weaving faults. The slowing-down system of the bobbins presented there produces a tension in the warp thread that is dependent on the diameter of the bobbin. Furthermore this device is

not suitable for a complete change of the weaving frame or a bobbin change with an automaton because the location of the unwound thread at the top of the bobbin is not set correctly and putting up the sleeve on a spindle requires a very accurate positioning of the bobbin sleeve in relation to the spindle. In the warp thread guiding spindles the various warp threads are not separated from each other. Separation gratings are however provided at certain distances in the weaving frame. But between these separation gratings the warp threads can become entangled with each other.

[0011] In German patent application no 4442231, a multiposition textile machine is known which has a supply creel consisting of a framework for a multitude of single bobbin carriers. The carriers are freestanding, have a support for a single bobbin and are self contained transport units. Preferably, a bobbin is held in a carrier on a slanting peg supported by a floor plate and a back plate. The carrier is placed in the creel in sliding rails which are built into the creel framework. The bobbins are loaded into the carriers as a separate operation away from the creel. The floor plate of each carrier has clips to hold the yarn start and yarn end while it is being transported. The yarn is knotted in on the creel, either by hand or automatically.

[0012] In French patent application no 2318815, a creel is described which comprises a series of frames which can be stacked on each other. Each frame has a horizontal platform on which the packages are supported and connected by cross-bars which are above the height of the yarn packages, and which carry yarn guides.

[0013] In US patent application no 3432118, a creel is disclosed which has several mobile units, each unit being a cabinet provided with a large number of elongated, parallel compartments open at the front. Independent package carriers are provided, each fitting removably into one of the compartments of the cabinet. Each carrier has a limited number of equally spaced, parallel rotatable shafts. Each shaft is arranged to store a yarn package, with capacity for free rotation. Yarns are withdrawn from the package simultaneously and along a line perpendicular to the axes of the packages.

[0014] The object of this invention is to provide an improved weaving frame or weaving frame module for a weaving device on which the warp thread bobbins can be changed more easily without causing any interruption or any disturbance to the warp thread tension in the weaving zone of a weaving device.

[0015] In order to achieve this a weaving frame or weaving frame module is presented as described in the introductory part of the main claim attached hereto, in which each frame or module is subdivided into a number of fixed cells destined for taking individual bobbin pallets each of which comprises means for holding a bobbin and for guiding and braking a thread. According to a further characteristic of the invention the individual cells can be formed by the divisions which are determined in the frame or module by the supporting means which are provided for the bobbin pallets to be taken in those cells.

[0016] Furthermore the cells are preferably provided with means for separating the continuous warp threads from the individual cells, such as for example a reed. These serve to prevent them from becoming entangled with each other. The bobbin is suitably inclined vertically or slight upward, almost horizontally disposed and the warp thread is pulled off axially (unthreaded).

[0017] The weaving frame consists of a number of frameworks or doors. Each framework is accessible on both side and comprises supporting means for a number of modules. This framework is disposed independently of and behind the warp thread tensioning and pulling-back device.

[0018] According to a distinctive feature of the invention this framework can be disposed fixed or wheeled in widthwise direction. Modules or containers are placed in this framework. Subdivision into modules can e.g. occur upward per pile warp thread in order to enable only one pile warp thread to be changed. Subdivision in depth will take into account the available space of passage behind the weaving frame. Subdivision in width can be per row or per two adjacent rows. Replacement of a bobbin must remain possible on both sides of a door. Taking out and moving a module or container can occur with a roller bridge or another lifting device, the weaving frame can also be made as a transportable unit.

[0019] The invention furthermore also provides bobbin pallets specifically developed for such weaving frames and weaving frame modules foreseen for taking one bobbin and equipped with means for guiding and braking a thread, such as preferably a throughput eye and a thread brake.
A bobbin can moreover very suitably be taken in a bobbin pallet with the help of means for supporting and/or means for holding a bobbin sleeve.

[0020] According to a first embodiment of the invention the bobbin pallet can comprise a bottom plate in which the means for holding a bobbin sleeve are provided.
This embodiment is in particular very suitable for conical cross-wound spools.

[0021] Each bobbin pallet has a bottom plate in which a throughput opening is provided for the bobbin sleeve. In a particular embodiment this throughput opening comprises an elastic holding device for the sleeve in order to prevent the bobbin from being pulled against the above lying throughput eye with thread brake by the tractive force in the warp thread and the sleeve from being raised out of the bore. A mat of soft foam rubber is placed in each cell. This mat also has a throughput opening adapted to the diameter of the bobbin sleeve. This foam rubber mat takes on the form of the end curvature of the bobbin through which windings are prevented from reaching under the winding body and thus preventing the pulling-off of the warp thread. The bobbins are disposed vertically and the warp threads are

pulled off axially (unthreaded).

[0022] According to a second embodiment of the invention the bobbin pallet can be equipped with a slightly upwardly inclined horizontal supporting spindle. A sleeve is rotatably attached to this spindle. The bobbin with the winding sleeve is then slid onto this sleeve. When overwinds occur of the bobbin edges then these are pulled onto the winding sleeve and by being rotatable these overwinds can be further unwound without this becoming a tension. A slight inclination is given to the supporting spindle in order to prevent the spool from sliding off the spindle during transport of the pallet or during weaving. The warp threads in this embodiment are therefore pulled off (unwound) tangentially.

[0023] This embodiment is in particular very suitable for cylindrical cross-wound spools. Through this embodiment possible problems are avoided which could occur when a cylindrical cross-wound spool body shows overwinds on the edges. With the first embodiment of the invention in such a situation the yarn could be pulled between the spool body and the bottom plate of the bobbin pallet through which the bobbin could finally nevertheless be raised out of the pallet bore. This phenomenon can also occur with conical cross-wound spool bobbins which may show overwinds on the spool edge with the largest diameter.

[0024] In the axis of the bobbin on top in the bobbin packet a throughput eye with thread brake is disposed attached to the frame on the bobbin packet. Each cell is further provided with a reed for holding up and separating the continuous warp threads from other cells through which the warp threads are prevented from entangling with each other.

[0025] A finished bobbin can easily be manually replaced in such a cell. The bobbin sleeve is raised out of its holder opening with clip device and taken out of the cell. The warp thread carries on running through the fixed throughput eye with thread brake. The warp thread that runs to the front of the frame to the weaving zone remains under tension and is not disturbed if the end that runs from the throughput eye to the bobbin is held slack. In this slack end the thread from the empty bobbin can be cut off and a new bobbin can be tied on. The new bobbin is then placed with the sleeve in the opening and clip device of the cell bottom.

[0026] The advantages of such a device are obvious. A bobbin can be replaced without disturbance to the warp thread tension on an operating weaving machine in a shorter time. The warp threads will be less entangled with each other and therefore cause fewer tensions. With a pile weaving machine the pile height will therefore be more uniform. A pile warp thread can quickly be completely changed with an idle machine by removing a number of modules or pallets and replacing them with externally prepared new modules. Finally a complete frame can be changed with an idle weaving machine by replacing all modules with new externally prepared modules. The time necessary for a color change is greatly reduced and the total weaving output of the installation will increase.

[0027] Color changes will also be able to be carried out more frequently while maintaining a considerable total output. The weaving mill will therefore be more flexible for following the demand for color changes. Furthermore shorter running lengths can be efficiently performed in a specific color combination.

[0028] For bobbins with a length that is greater than the diameter, the vertical disposition of the bobbins will cause the total height of the frame to increase. But upward there is now sufficient space since that height is just available for the Jacquard device with superstructure. The bobbin diameter will now determine the width of a door. With an equal number of doors, the width of the frame will be smaller which is convenient for the angle of entry in width direction of the warp threads into the weaving machine.

[0029] Existing weaving frames are not particularly suitable for bobbin changing with an automaton. In order to place a bobbin with sleeve on a horizontal spindle the adjustment of the bobbin in relation to the spindle must be rather accurate and the spindles have to be at a precise distance from each other. The weights in the form of clamps or trammels on the pulled-off warp thread are a hinderance for easy replacement of a bobbin. Furthermore the location of the pulled-off warp thread in function of the unwinding cannot be correctly determined. Because of this the gripping of the finished warp thread above the bobbin by an automaton is rather complicated. During the bobbin changing the warp thread must be able to be further pulled off so that the weaving process can continue undisturbed. This means that the bobbin cannot be gripped at the sleeve, unless a certain rotating movement is permitted during the manipulation. This is of course a complication. The new bobbin must be presented with the warp thread beginning which must be easily accessible for a gripper. Existing weaving frames offer no solution for these problems.

[0030] A further object of the invention is to provide a weaving frame whereby each individual bobbin can be replaced by an automaton both on an idle and on an operating weaving machine.

[0031] In order to achieve this task a number of difficulties that arise with existing weaving frames must be resolved. The warp thread tensioning and recovery device must be made free of the bobbin; the bobbin must be able to be placed on the weaving frame by a device whereby no mm positioning accuracy is required, the location of the finished warp thread must be well determined; while bobbin changing the warp thread from the bobbin to be removed must be able to be further pulled off; the beginning thread end of the new bobbin to be mounted must be localized in order to be able to grip this with an automaton.

[0032] In order to resolve these difficulties according to the invention the warp thread tensioning and pulling-back device is placed independently from and in front of

the weaving frame. The weaving frame itself consists of fixed or moveable frameworks or doors which are accessible on both sides. In this framework a number of cells are provide with fixed thread guiding reeds. In these cells changeable pallets are placed. These pallets are provide with means for clamping and wedging a bobbin. A pallet changing automaton is provided with means for transporting and changing the pallets, for bringing yarn ends together and for tying or splicing these together. The pallet changing automaton will be carried by a three-dimensional positioning robot so that each cell of the weaving frame and a number of cells of the loading and removal station for reception and removal of pallets are accessible for running with a program.

[0033] The invention finally also relates to a method for changing warp thread bobbins in a weaving frame or weaving frame module of a weaving device, without causing any interruption or any disturbance to the warp thread tension in the weaving zone.

According to this method the above described weaving frames or weaving frame modules and bobbin pallets are used, whereby while changing bobbins the warp thread of the bobbin pallet to be replaced is made to hang slack, is cut off and tied to the thread ends of the replacing bobbin pallets, after which the bobbin pallet is changed over and the replacing bobbin pallet is placed in the cell in question. Very suitable use can moreover be made of a pallet changing automaton which is provided for transporting and changing the interchangeable bobbin pallet, for bring the thread ends together and for knotting or splicing these together. The pallet changing automaton can moreover be very suitably carried by a positioning robot and be operated by a computer that regulates the changing of the bobbin pallets in function of the diameter of the bobbins disposed on individual bobbin pallets in the weaving frame or the weaving frame modules, measured with the assistance of a measuring system controlled by the computer, and in function of the pattern of the Jacquard fabric to be woven and the theoretical thread consumption for that purpose.

[0034] These and other characteristics and distinctive features of the invention will ensue from the following description in which reference is made to the attached drawings which show an embodiment of a weaving frame and pallet according to the invention

[0035] In these drawings:

Figure 1 is a side view of a weaving frame for detachable bobbin pallets according to the invention;
Figure 2 is a front view of the weaving frame shown in figure 1;
Figure 3 is a top view of the weaving frame shown in figures 1 and 2;
Figure 4 is a side view of a first embodiment of a bobbin pallet according to the invention;
Figure 5 is a front view of the pallet shown in figure 4;
Figure 6 is a top view of the pallet shown in figures 4 and 5;
Figures 7-9 are views that correspond to figures 4-6 of a bobbin disposed on a pallet as shown in these figures;
Figures 10-12 are views of a part of the weaving frame shown in figures 1-3 and provided with bobbin pallets and bobbins;
Figures 13a) - 13g) are partial top views of the weaving frame according to the invention during the course of the various steps of bobbin changing with the assistance of a pallet changing automaton;
Figure 14 is a side view on a larger scale of the pallet changing automaton as shown in figures 13a) - 13g);
Figure 15 is a top view on a larger scale of figure 13 d) ;
Figure 16 is a schematic representation, in top view of the knotting of the threads while changing the bobbin pallets;
Figure 17 is a side view of a second embodiment of a bobbin pallet according to the invention;
Figure 18 is a front view of the pallet shown in figure 17;
Figure 19 is a top view of the pallet shown in figure 18;
Figure 20 is a view corresponding to figure 17 of a bobbin disposed on a pallet as shown in that figure.

[0036] In these drawings the same reference signs indicate the same or similar elements.

[0037] As presented in Fig. 1-3, each weaving frame consists of a number of doors 1 which extend in warp direction and of which a number are disposed next to each other with a space in width direction. Each door is accessible on both sides because of the fact that these are placed at a certain distance from each other in width direction in order to provide passage to a pallet changing automaton. Each door consists of an external framework, consisting of horizontal frame staves 101, 102 and vertical frame staves 103, with central supporting staves 104 for supporting means of carrying arms 2 which extend horizontally like "antennas" from those central supporting staves 104 (forward and backward in relation to figure 1). The carrying arms 2 are at a specific height and depth from each other. The distance between carrying arms in height and in depth determines a cell. Each cell is provided with a warp thread reed 3, which is placed just under a carrying arm so that this carrying arm forms the top of the reed.

[0038] The bobbins are placed vertically on pallets 4 (Fig. 7-9). Such a pallet is made of steel plate, aluminum, plastic or wood. Each pallet has a hole 6 in the bottom 5 for passage of a bobbin sleeve. Means are provided in that opening for clamping a bobbin sleeve. These means are e.g. stop surfaces 7 provided with leaf springs 8 which clamp onto the inside of the sleeve. Because of this the bobbin is prevented from rising up through the tractive force in the warp thread. A foam rub-

ber mat 9 is placed on the bottom of the pallet. This foam rubber mat 9 takes on the form of the end curvature of the bobbin. With this windings are prevented from falling under the winding body 18 of the bobbin and thus preventing pulling-off.

[0039] The pallet furthermore has two pallet carrying profiles 10 on the side, which serve for putting it on the carrying arms 2 of the weaving frame or for being able to place the pallet on a roller conveyor belt. Two bulges 21 are provided in the pallet carrying profiles 10. These bulges fit into bores that are applied in the carrying arms 2 of the weaving frame and in so doing form a stop in order to prevent the pallets from sliding off the carrying arms. The bottom of the pallet has a bumper 11 at the front and back. This bumper serves for moving the pallet onto a roller conveyor belt by pushing along. Each pallet has a holder 12 that is attached permanently or by clipping onto a side of the bottom of the pallet.

[0040] On top the holder 12 has a vertical projection 13 and a horizontal part 14. The projection 13 supports a thread clip 15. The horizontal part 14 supports a throughput eye 16 with thread brake 17. This throughput eye 16 lies in the axis of the bobbin. The thread clip 15 consists of a leaf spring with bore 20 for a stop pin and a slot, for attachment of a thread end against the support 13 (Fig. 7-9). The throughput eye 16 is e.g. a porcelain eye. On the upper surface of the eye a leaf spring with pressure ring 17 is installed for slowing down the warp thread. The warp thread can therefore be pulled off in all directions. The holder 12 has a vertically extending part 13 and the thread clip is attached to the top of this part. The horizontal part 14 of holder 12 lies under the level of the thread clip 15 and the other extremity has an upward bending so that the throughput eye 16 comes back to the level of the thread clip 15 (FiG. 7-9).

[0041] The cross-wound spool or bobbin with the sleeve is put vertically through the opening in the foam rubber mat 9 and in the pallet bottom (Fig. 7-9). The winding body 18 rests on the foam rubber mat 9 and the sleeve is held in the bottom clips 8. The beginning thread end 19 of the bobbin is brought through the throughput eye 16, under the thread brake 17 and the extremity of the thread 19 is pulled into the thread clip 15, so that the thread 19 comes to lie stretched between thread clip 15 and throughput eye 16. In this manner the location of the beginning thread end of the bobbin is correctly set.

[0042] The variant of the bobbin pallets according to a second embodiment of the invention shown in figures 17 - 20 for the greater part comprises analogue parts which are indicated by the same reference numbers in the drawings. According to this second embodiment of the invention the bobbin pallet is equipped with a slightly upwardly inclined horizontal supporting spindle. A sleeve 41 is rotatably attached to this spindle 40. The bobbin 18 with the winding sleeve 42 is then slid onto this sleeve 41. When overwinds occur on the bobbin edges these are then pulled onto the winding sleeve and by being rotatable these overwinds can be further unwound without a tension occurring. A slight inclination is given to the supporting spindle in order to prevent the spool from sliding off the spindle during transport of the pallet or during weaving.

The warp threads are therefore pulled off (unwound) tangentially.

[0043] The pallets rest with the pallet carrying profiles 10 on the carrying arms 2 of the weaving frame (Fig. 10). From a pallet that is in the weaving frame the warp thread is pulled off through the throughput eye 16 with thread brake over a warp thread reed 3 fixedly attached to the frame. When a pallet is slid out of the frame in width direction, the warp thread still keeps running out, from the fixed thread reed 3 up to the actual position of the throughput eye 16 at the top of the pallet. The location of the warp thread end of the finished bobbin is well-determined because of this.

[0044] There is a certain play between the carrying arms 2 and the pallet carrying profiles 10. The positioning of the pallet in relation to the weaving frame therefore does not need to be so accurate in depth direction of the frame. In width direction the pallet must be slid sufficiently far over a stop. This stop must prevent the pallet from sliding out of the frame.

In height direction the pallet has to be raised sufficiently high in order to be able to slide in or out over the stop. With this the problem of accurate positioning is completely solved.

[0045] The system for bobbin changing with automaton comprises a pallet preparation system with storage of the prepared pallets in waiting ranks, a loading and removal station for the pallets, a transport system for transporting the prepared pallets, which are placed in waiting ranks, to the cells in the weaving frame and vice versa, a pallet changing automaton 22 which removes the old, almost empty pallet and replaces this with a new one, and a tying-on automaton or splicer for connecting the old and new bobbin.

[0046] In a pallet preparation system or palletizing station the bobbins are removed from the supply packaging and in each case placed on a pallet according to the invention. Here the thread beginning end 19 is sought and this thread end is pulled through the throughput eye 16 with thread brake 17 up to the thread clip 15 so that the thread is stretched between thread clip 15 and throughput eye 16. The pallets are then placed in a waiting rank per color of the bobbins placed thereon. This palletization operation can occur manually or with an automaton.

[0047] An x,y,z gantry robot or overhead travelling robot is for example employed as transport device. This robot is provided with a pallet changing automaton 22 with a tying-on or splicer automaton. The robot goes according to an operating program to get a pallet with a bobbin of a certain color from the waiting rank of the color in question in a loading station in order to take a pallet with full bobbin in the part of the pallet changing automaton 22 provided for that purpose. The robot

brings this pallet changing automaton 22 to the cell in the weaving frame where a bobbin is to be replaced.

[0048] As shown in figure 13 and 15 the pallet changing automaton 22 consists of three parts:

- a part 23 with a filled pallet,
- a changing part 24 and
- a part 25 into which the almost empty pallet from the weaving frame will come.

[0049] The pallet changing automaton is now brought by the robot control with the changing part 24 right in front of the cell of the bobbin to be replaced (Fig. 13a). The pallet changing automaton slides the pallet with the almost empty bobbin in width direction out of the weaving frame into the changing part (Fig. 13b). The weaving machine can hereby continue to operate. The warp thread can be pulled off further from the bobbin, because the warp thread hereby continues to run from the fixed thread reed 3 to the throughput eye 16 with thread brake 17 up to the bobbin.

[0050] Two moveable hooks 26 and 27 move toward each other and bring the warp thread still pulled off through the weaving process into a specific position (Fig. 13c, 15 and 16). The pallet changing automaton now moves the almost empty pallet into the vacant part 25 and the full pallet 23 into the changing part 24. This movement is performed horizontally in depth direction until the new full pallet comes to stand right in front of the cell (Fig. 13d). With this movement the warp thread of the almost empty bobbin is further pulled off since the warp thread still remains connected. The warp thread is also pulled into a third hook 28 through this movement. This hook 28 is fixedly connected to the pallet changing automaton and hooks in onto the thread end just next to the throughput eye in the horizontally stretched warp thread zone between throughput eye and thread clip device.

[0051] The pulled-off warp thread is positioned between the hooks 26, 27 and 28 and forms a first arm of the cross form 29 (fig. 16). From the new pallet with full bobbin the thread beginning is well localized namely from the thread clip 15 up to the throughput eye 16 above the bobbin. This is to make the second arm of the cross form 29 under the insertion groove of the splicer 30 (Fig. 14 and 15). The cross form 29 serves for presenting both warp threads to be attached in the respective groove 31 and 32 of the splicer 30 or tying-on apparatus (fig. 14).

[0052] In order to provide for a warp thread consumption during the subsequent tying-on operation, the robot can still perform an extra horizontal movement in depth direction, so that the warp thread is still pulled off a little more and that can be interwoven during the tying-on operation, whereby the robot then performs a gradual return movement.

[0053] Two rotatable and vertically moveable hooks 33 are attached on both sides of the splicer 30 (Fig. 14-16). The hooks 33 swivel under the cross of the warp threads and pull the cross form of both warp threads together upward in a vertical movement until the cross comes to lie in the respective grooves 31 and 32 of the splicer or the tying-on apparatus. This splicer or tying-on apparatus is attached at the top of the pallet changer (Fig. 13e).

[0054] The splicer 30 or tying-on apparatus carries out the attachment and cuts off the thread of the empty bobbin and the thread of the new bobbin to the thread clip 15. This remaining end remains hanging in the thread clip of the new pallet but this does not cause any interference at all (Fig. 13f). The warp thread which is now interwoven runs from the fixed thread reed in the weaving frame to the throughput eye with thread brake of the new pallet. The new pallet is now slid into the frame by the pallet changing automaton (Fig. 13g). With this the bobbin changing is complete.

[0055] The pallet with almost empty bobbin is now brought by the robot to a pallet removal station. The remaining thread will hereby not further unwind during the transport because the end is still in the thread brake 17 of the throughput eye 16. The pallet removal station will preferably be next to the waiting rank of the newly prepared pallets. In this manner positioning only has to take place once and the unloading and loading operation can take place at the same time. There will be a specific place of loading, and removal station for each color of the warp thread.

[0056] The pallet changing automaton can also be provided with a stack for newly prepared pallets and a stack for empty old pallets. The stack for newly prepared pallets will connect to the part for a full new pallet and the stack for empty pallets will connect to the part for the empty pallet. Because of this extension the robot can work more efficiently because of the fact that fewer movement routes from and to the loading and removal station have to be made.

[0057] In order to be able to serve both a left and right side of a passage between two weaving frame doors the pallet changing automaton will be equipped with a left and right part each with its own tying-on automaton or splicer. Of course only one part, either the left part of the right part will be operational.

[0058] In order to determine when a bobbin needs to be changed, the robot is equipped with a measuring system for measuring the diameter of the bobbins disposed in the frame on the pallets. The robot can according to a determined program go and measure all rows in a specific door and these measurement data are stored in the memory of a weaving frame control computer. If a minimum diameter is measured for a bobbin then a signal is given for replacement of the pallet on that specific cell. The control computer can determine which color must be replaced from the bobbin loader plan that is also stored in the computer. Such a unit can therefore work alone.

[0059] The controller of an electronic Jacquard ma-

chine knows the pattern to be woven. This controller is connected to the control computer in a network. The Jacquard controller periodically sends the theoretical thread consumption of the already woven length through to the control computer. The weaving frame control computer takes this into account in determining the measurement program for measuring the bobbin diameters and with this predicts when a bobbin will finish in the weaving frame. Thus bobbin pallets can be replaced just before finishing without causing any interruption in the weaving process and whereby the waste in remaining yarns is avoided.

[0060] The device also fills an empty frame with newly prepared bobbin pallets in the case of a first start-up of an installation. For this purpose it is sufficient to provide a program whereby no "old" pallets need to be removed from the weaving frame. The threading through the reeds and the thread tensioning device has to be done manually. After filling up the whole weaving frame it is then switched over to the maintenance program of the weaving frame. A program also has to be provided for the systematic replacement of a pile warp thread or of the whole weaving frame for switching over to other colors.

[0061] The advantages of such a device are clear: bobbin changing becomes less labor-intensive and can be performed according to thread consumption and bobbin measurement, standing idle for and caused by bobbin changing is greatly decreased, bobbin changing is carried out without causing any disturbance to the warp thread tension, through which fewer idle times of the weaving machine occur through temporarily slack warp threads. Because of the fact that each cell comprises a guiding reed, the warp threads will become less entangled and thus cause less tensions. The weaving machine will also stand idle for less time for a partial or full color change. By entrusting the weaving frame control to a computer that is linked to the robot with bobbin changing automaton further color variations can be introduced into every pile warp thread in the form of lattice colors. The computer now controls every bobbin pallet individually and this can also be controlled according to a color scheme program. In this manner the fabric can therefore be designed with more colors without running the danger that the color control becomes no longer controllable.

[0062] This weaving frame can of course also be placed behind a beam machine in order to function as a beam frame. The same method for changing bobbins can be applied.

Claims

1. Weaving frame or weaving frame module for supporting warp thread bobbins for a weaving device, on which the bobbins can at least be partly changed without causing any interruption or any disturbance to the warp thread tension in the weaving zone of the weaving device, each frame or module (1) being subdivided into a number of fixed cells for taking individual bobbin pallets and each cell being determined by supporting means (2) for the individual bobbin pallets provided on the frame or module and comprising means for holding a bobbin, **characterized in that** each cell is further provided with means (16) for guiding a thread and means (17) for braking said thread.

2. Weaving frame or weaving frame module according to claim 1, **characterised in that** each cell is further provided with means (3), for separating the continuous warp threads from the individual cells through which the warp threads are prevented from becoming entangled with each other.

3. Weaving frame or weaving frame module according to any one of claims 1 and 2, **characterized in that** the aforesaid means (3) comprise a thread reed of which the supporting means (2) in each case form the top.

4. Bobbin pallet for a weaving frame or weaving frame module, for supporting warp thread bobbins for a weaving device, allowing the bobbins to be at least partly changed without causing any interruption or any disturbance to the warp thread tension in the weaving zone of the weaving device, each frame or module (1) being subdivided into a number of fixed cells for taking individual bobbin pallets and each cell being determined by supporting means (2) for the individual bobbin pallets provided on the frame or module and comprising means for holding a bobbin, **characterized in that** each bobbin pallet comprises means (6, 7, 8), (40, 41) for supporting and/or holding a bobbin sleeve, a throughput eye (16) for guiding a thread, and a thread brake (17).

5. Bobbin pallet according to claim 4 **characterized in that** this comprises a bottom plate (5) in which the aforesaid means (6, 7, 8) for holding a bobbin sleeve are provided.

6. Bobbin pallet according to claim 5 **characterized in that** on the aforesaid bottom plate a mat (9) of soft foam rubber is placed with a throughput opening adapted to the diameter of the bobbin sleeve.

7. Bobbin pallet according to claim 4 **characterized in that** the aforesaid means for supporting a bobbin sleeve comprise a slightly upwardly inclined horizontal supporting spindle (40) with a rotatable supporting sleeve (41) over which a bobbin sleeve can be slid.

8. Bobbin pallet according to any one of claims 4 to 7

characterized in that is comprises two pallet carrying profiles (10) on the side, which serve for putting it on carrying means (2) of the weaving frame cell and/or for being able to place the pallet on a roller conveyor belt.

9. Bobbin pallet according to any one of claims 4 to 8 **characterized in that** each pallet comprises a holder (12) at the top provided with vertical projection (13) that carries a thread clip (15) for presenting a thread end at a specific place, and with a horizontal part (14), that carries the aforesaid throughput eye (16) and the aforesaid thread brake (17), whereby the throughput eye (16) lies in the axis of the bobbin and the thread clip (15) consists of a leaf spring and serves for presenting the thread end at a specific place.

10. Method for at least partly changing warp thread bobbins in a weaving frame or weaving frame module of a weaving device, without causing any interruption or any disturbance to the warp thread tension in the weaving zone of the weaving device, the weaving frame or weaving frame modules are subdivided into a number of fixed cells destined for taking individual bobbin pallets each of which comprises means for holding a bobbin, **characterised in that** each cell further comprises means for guiding and braking a thread, which cells are further provided with means (3) for separating the continuous warp threads from the individual cells, whereby while changing bobbins the warp thread in an already present bobbin pallet, is made to hang slack in relation to the means for guiding and braking the thread, is cut off and tied to the thread ends of the replacing bobbin pallets, after which the bobbin pallet is changed over and the replacing bobbin pallet is placed in the cell in question.

11. Method according to claim 10, **characterized in that** the changing of the bobbin pallets occurs by means of a pallet changing automaton which is provided for transporting and changing the changeable bobbin pallets, for bringing yarn ends together and for tying or splicing these together.

12. Method according to claim 10, **characterized in that** the following elements are present:

- a pallet preparation system with storage of the prepared pallets in waiting ranks,
- a loading and removal station for the pallets,
- a transport system for transporting the prepared pallets, which are placed in waiting ranks, to the cells in the weaving frame and vice versa,
- a pallet changing automaton (22) which removes the old, almost empty pallets and replaces these with a new one, and
- a tying-on automaton or splicer for connecting the old and new bobbin.

13. Method according to any one of claims 11 and 12, **characterized in that** the pallet changing automaton comprises the following parts:

- a part (23) with at least one filled pallet,
- a changing part (24) and
- a part (25) into which at least one almost empty pallet from the weaving frame will come.

14. Method according to any one of claims 11 to 13, **characterized in that** the pallet changing automaton is carried by a positioning robot and is controlled by a computer that regulates the changing of the bobbin pallets in function of:

- the diameter of the bobbins disposed on individual bobbin pallets in the weaving frame or the weaving frame modules, measured with the assistance of a measuring system controlled by the computer,
- the pattern of the Jacquard fabric to be woven and the theoretical thread consumption for that purpose.

15. Method according to any one of claims 13 and 14, **characterized in that** for changing a bobbin pallet the pallet changing automaton slides the pallet with the almost empty bobbin in width direction out of the weaving frame into the changing part whereby the warp thread can be pulled off further from the bobbin and subsequently moves the almost empty pallet into the vacant part (25) and the full pallet (23) into the changing part (24) horizontally in depth direction until the new full pallet comes to stand right in front of the cell, whereby through this movement the warp thread is pulled into a hook (28), which is fixedly connected to the pallet changing automaton (22) and hooks in onto the thread end just next to the throughput eye (16) in the horizontally stretched warp thread zone between throughput eye (16) and thread clip device (15).

16. Method according to any one of claims 11 to 14 **characterized in that** for changing a bobbin pallet the thread running toward the weaving device of the bobbin pallet to be replaced and the thread of the replacing bobbin pallet - which owing to a thread clip provided on that pallet is accurately localized - are brought into a cross form (29) with the assistance of hooks (26), (27) and (28) and are pulled in a vertical movement together upward by one or more rotatable and vertically moveable hooks (33) that swivel under the thread cross (29) in order to lead them into respective grooves (31) and (32) of

a splicer or tying-on apparatus.

Patentansprüche

1. Webspulengatter oder Webspulengattermodul zum Tragen von Kettfadenspulen für eine Webvorrichtung, auf welcher die Spulen mindestens teilweise gewechselt werden können, ohne eine Unterbrechung oder eine Störung der Kettfadenspannung in der Webzone der Webvorrichtung zu verursachen, wobei jedes Gatter oder jedes Modul (1) in eine Anzahl von festen Zellen zum Fassen einzelner Spulenpaletten unterteilt ist und wobei jede Zelle durch Tragmittel (2) für die auf dem Gatter oder Modul vorgesehenen einzelnen Spulenpaletten bestimmt ist und Mittel zum Halten einer Spule umfasst, **dadurch gekennzeichnet, dass** jede Zelle ferner mit Mitteln (16) zum Führen eines Fadens und Mitteln (17)zum Bremsen des Fadens versehen ist.

2. Webspulengatter oder Webspulengattermodul gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jede Zelle ferner mit Mitteln (3) zum Trennen der fortlaufenden Kettfäden von den einzelnen Zellen versehen ist, durch welche verhindert wird, dass die Kettfäden miteinander verheddert werden.

3. Webspulengatter oder Webspulengattermodul gemäß einem der Ansprüche 1 und 2, **dadurch gekennzeichnet, dass** die vorhergehend erwähnten Mittel (3) einen Fadenkamm umfassen, bei welchem die Tragmittel (2) in jedem Fall die Oberseite bilden.

4. Spulenpalette für ein Webspulengatter oder ein Webspulengattermodul zum Tragen von Kettfadenspulen für eine Webvorrichtung, welche erlaubt, dass die Spulen zumindest teilweise gewechselt werden, ohne eine Unterbrechung oder eine Störung der Kettfadenspannung in der Webzone der Webvorrichtung zu verursachen, wobei jedes Gatter oder Modul (1) in eine Anzahl von festen Zellen zum Fassen einzelner Spulenpaletten unterteilt ist und wobei jede Zelle durch Tragmittel (2) für die einzelnen auf dem Gatter oder auf dem Modul vorgesehenen Spulenpaletten bestimmt ist, und Mittel zum Halten einer Spule umfasst, **dadurch gekennzeichnet, dass** jede Spulenpalette Mittel (6, 7, 8), (40, 41) zum Tragen und/oder Halten einer Spulenhülse, eine Durchgangsöse (16) zum Führen eines Fadens und eine Fadenbremse(17)umfasst.

5. Spulenpalette gemäß Anspruch 4, **dadurch gekennzeichnet, d**ass diese eine Bodenplatte (5) umfasst, in welcher die vorhergehend genannten Mittel (6, 7, 8) zum Halten einer Spulenhülse vorgesehen sind.

6. Spulenpalette gemäß Anspruch 5, **dadurch gekennzeichnet, dass** auf der vorhergehend genannten Bodenplatte eine Matte (9) aus weichem Schaumgummi platziert ist, die eine Durchgangsöffnung aufweist, welche an den Durchmesser der Spulenhülse angepasst ist.

7. Spulenpalette gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die vorhergehend genannten Mittel zum Tragen einer Spulenhülse eine leicht aufwärts geneigte horizontale Tragspindel (40) mit einer rotierbaren Traghülse (41), über welche eine Spulenhülse geschoben werden kann, umfassen.

8. Spulenpalette gemäß einem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** sie zwei Palettentragprofile (10) auf der Seite umfasst, welche dazu dienen, sie auf Tragmittel (2) der Webspulengatterzelle zu stellen und/oder um zu ermöglichen, die Palette auf einem Rollförderband zu platzieren.

9. Spulenpalette gemäß einem der Ansprüche 4 bis 8, **dadurch gekennzeichnet, dass** jede Palette einen Halter (12) umfasst, welcher an der Oberseite mit einem vertikalen Vorsprung (13) versehen ist, der einen Fadenhalter (15) zum Darbieten eines Fadenendes an einem bestimmten Platz trägt, und mit einem horizontalen Teil (14) versehen ist, der die vorhergehend genannte Durchgangsöse (16) und die vorhergehend genannte Fadenbremse (17) trägt, wobei die Durchgangsöse (16) in der Spulenachse liegt und der Fadenhalter (15) aus einer Blattfeder besteht und zum Darbieten des Fadenendes an einem bestimmten Platz dient.

10. Verfahren zum mindestens teilweisen Wechseln von Kettfadenspulen in einem Webspulengatter oder einem Webspulengattermodul einer Webvorrichtung, ohne eine Unterbrechung oder eine Störung der Kettfadenspannung in der Webzone der Webvorrichtung zu verursachen, wobei das Webspulengatter oder das Webspulengattermodul in eine Anzahl von festen Zellen unterteilt sind, die zum Fassen einzelner Spulenpaletten bestimmt sind, wobei jede von diesen Mittel zum Halten einer Spule aufweist, **dadurch gekennzeichnet, dass** jede Zelle ferner Mittel zum Führen und Bremsen eines Fadens umfasst, wobei die Zellen ferner mit Mitteln (3) zum Trennen der fortlaufenden Kettfäden von den einzelnen Zellen versehen sind, wobei während eines Spulenwechsels der Kettfaden in einer schon vorliegenden Spulenpalette in Bezug auf die Mittel zum Führen und Bremsen des Fadens locker hängend gemacht wird, abgeschnitten wird und an die Fadenenden der Ersetzungsspulenpaletten angebunden wird, wobei danach die Spulenpalette gewechselt wird und die Ersetzungsspulenpalette in der besagten Zelle platziert wird.

11. Verfahren gemäß Anspruch 10, **dadurch gekennzeichnet, dass** das Wechseln der Spulenpaletten unter Verwendung eines Palettenwechselautomaten geschieht, welcher zum Transport und zum Wechseln der auswechselbaren Spulenpaletten, zum Zusammenbringen der Fadenenden und zum Zusammenbinden oder Verspleißen dieser vorgesehen ist.

12. Verfahren gemäß Anspruch 10, **dadurch gekennzeichnet, dass** die folgenden Elemente vorliegen:

- ein Palettenvorbereitungssystem mit Speichern der vorbereiteten Paletten in Warteränge,
- eine Lade- und Entfernstation für die Paletten,
- ein Transportsystem zum Transportieren der vorbereiteten Paletten, welche in Warteränge platziert sind, zu den Zellen in dem Webspulengatter und umgekehrt,
- ein Palettenwechselautomat (22), welcher die alten, nahezu leeren Paletten entfernt und diese mit einer neuen ersetzt, und
- ein Anbindeautomat oder Verspleißer zum Verbinden der alten und neuen Spule.

13. Verfahren gemäß einem der Ansprüche 11 und 12, **dadurch gekennzeichnet, dass** der Palettenwechselautomat die folgenden Teile umfasst:

- einen Teil (23) mit mindestens einer gefüllten Palette,
- einen Wechselteil (24) und
- einen Teil (25), in welchen mindestens eine nahezu leere Palette von dem Webspulengatter kommen wird.

14. Verfahren gemäß einem der Ansprüche 11 bis 13, **dadurch gekennzeichnet, dass** der Palettenwechselautomat durch einen Positionierungsroboter getragen wird und durch einen Computer gesteuert/geregelt wird, der das Wechseln der Spulenpaletten regelt, in Abhängigkeit von:

- dem mit Hilfe eines Messsystems, welches durch den Computer gesteuert/geregelt wird, gemessenen Durchmesser der auf einzelnen Spulenpaletten in dem Webspulengatter oder den Webspulengattermodulen angeordneten Spulen,
- dem Muster der zu webenden Jacquard-Ware und dem theoretischen Fadenverbrauch zu diesem Zweck.

15. Verfahren gemäß einem der Ansprüche 13 und 14, **dadurch gekennzeichnet, dass** zum Wechseln einer Spulenpalette der Palettenwechselautomat die Palette mit der nahezu leeren Spule in seitlicher Richtung aus dem Webspulengatter in den Wechselteil schiebt, wobei der Kettfaden weiter von der Spule abgezogen werden kann, und nachfolgend die nahezu leere Palette in den leeren Teil (25) und die volle Palette (23) in den Wechselteil (24) horizontal in Tiefenrichtung bewegt, bis die neue volle Palette richtig auf der Vorderseite der Zelle zu stehen kommt, wobei durch diese Bewegung der Kettfaden in einen Haken (28) gezogen wird, welcher fest mit dem Palettenwechselautomaten (22) verbunden ist und auf das Fadenende einhakt, gerade neben der Durchgangsöse (16) in der horizontal gespannten Kettfadenzone zwischen Durchgangsöse (16) und Fadenklemmvorrichtung (15).

16. Verfahren gemäß einem der Ansprüche 11 bis 14, **dadurch gekennzeichnet, dass** zum Wechseln einer Spulenpalette der Faden, welcher in Richtung zur Webvorrichtung der zu ersetzenden Spulenpalette läuft, und der Faden der Ersetzungsspulenpalette - welcher wegen eines an dieser Palette vorgesehenen Fadenhalters genau lokalisiert ist - mit der Hilfe von Haken (26), (27) und (28) in Kreuzform (29) gebracht werden und in einer vertikalen Bewegung zusammen aufwärts durch einen oder mehrere drehbare und vertikal bewegbare Haken (33) gebracht werden, die sich unter dem Fadenkreuz (29) drehen, um diese in jeweilige Nuten (31) und (32) eines Verspleißungs- oder Anbindeapparates zu führen.

Revendications

1. Cadre de tissage ou module de cadre de tissage pour supporter des bobines de fil de chaîne dans un métier à tisser, sur lequel les bobines peuvent au moins en partie être changées sans provoquer aucune interruption ou perturbation de la tension des fils de chaîne dans la zone de tissage du métier à tisser, chaque cadre ou module (1) étant subdivisé en un certain nombre de cellules fixes destinées à accueillir des palettes de bobines individuelles et chaque cellule étant déterminée par des moyens de support (2) pour les palettes de bobines individuelles prévues sur le cadre ou le module et comprenant des moyens pour maintenir une bobine, **caractérisé en ce que** chaque cellule est en outre pourvue de moyens (16) de guidage de fil et de moyens (17) de freinage dudit fil.

2. Cadre de tissage ou module de cadre de tissage conformément à la revendication 1, **caractérisé en ce que** chaque cellule est en outre pourvue de moyens (3) servant à séparer les fils de chaîne continus provenant des cellules individuelles, ce qui empêche les fils de s'emmêler les uns avec les autres.

3. Cadre de tissage ou module de cadre de tissage conformément à l'une quelconque des revendications 1 et 2, **caractérisé en ce que** les moyens précités (3) comprennent un peigne de fil dont les moyens de support (2) forment dans chaque cas le sommet.

4. Palette de bobine pour un cadre de tissage ou un module de cadre de tissage, destinée à supporter des bobines de fil de chaîne dans un métier à tisser, permettant aux bobines d'être au moins en partie changées sans provoquer aucune interruption ou perturbation de la tension des fils de chaîne dans la zone de tissage du métier à tisser, chaque cadre ou module (1) étant subdivisé en un certain nombre de cellules fixes destinées à accueillir des palettes de bobines individuelles, et chaque cellule étant déterminée par des moyens de support (2) pour les palettes de bobines individuelles prévus sur le cadre ou le module et comprenant des moyens pour maintenir une bobine, **caractérisée en ce que** chaque palette de bobine comprend des moyens (6, 7, 8), (40, 41) de support et/ou de maintien d'un mandrin de bobine, un oeillet de débit (16) pour guider un fil et un frein de fil (17).

5. Palette de bobine conformément à la revendication 4, **caractérisée en ce que** celle-ci comprend une plaque de fond (5) dans laquelle sont prévus les moyens précités (6, 7, 8) de maintien d'un mandrin de bobine.

6. Palette de bobine conformément à la revendication 5, **caractérisée en ce qu'**il est placé sur la plaque de fond précitée un tapis (9) de caoutchouc mousse doux comportant une ouverture adaptée au diamètre du mandrin de bobine.

7. Palette de bobine conformément à la revendication 4, **caractérisée en ce que** les moyens précités de support d'un mandrin de bobine comprennent une broche de support horizontale légèrement inclinée vers le haut (40) avec un manchon de support rotatif (41) sur lequel un mandrin de bobine peut être glissé.

8. Palette de bobine conformément à l'une quelconque des revendications 4 à 7, **caractérisée en ce qu'**elle comporte sur les côtés deux profils de support de palette (10) qui servent à la poser sur les bras de support (2) de la cellule du cadre de tissage et/ou à pouvoir placer la palette sur une bande de convoyeur à rouleaux.

9. Palette, de bobine conformément à l'une quelconque des revendications 4 à 8, **caractérisée en ce que** chaque palette comprend un manche (12) pourvu à son sommet d'une projection verticale (13) qui porte une pince de fil (15) servant à présenter une extrémité de fil à un endroit spécifique, et d'une partie horizontale (14) qui porte l'oeillet de débit précité (16) et le frein de fil précité (17), l'oeillet de débit (16) se trouvant dans l'axe de la bobine et la pince de fil (15) étant constituée d'un ressort à lames et servant à présenter l'extrémité de fil à un endroit spécifique.

10. Méthode pour au moins partiellement changer des bobines de fil de chaîne dans un cadre de tissage ou un module de cadre de tissage d'un métier à tisser, sans provoquer aucune interruption ou perturbation de la tension des fils de chaîne dans la zone de tissage du métier à tisser, le cadre de tissage ou module de cadre de tissage étant subdivisé en un certain nombre de cellules fixes destinées à accueillir des palettes de bobines individuelles comprenant chacune des moyens pour maintenir une bobine, **caractérisée en ce que** chaque cellule comprend en outre des moyens pour guider et freiner un fil, lesdites cellules étant en outre pourvues de moyens (3) pour séparer les fils de chaîne continus provenant des cellules individuelles, tandis que lors du changement des bobines, le fil de chaîne dans une palette de bobine déjà présente est rendu lâche par rapport aux moyens de guidage et de freinage du fil, il est coupé et noué aux extrémités de fil des palettes de bobine de remplacement, après quoi la palette de bobine est changée et la palette de bobine de remplacement est placée dans la cellule en question.

11. Méthode conformément à la revendication 10, **caractérisée en ce que** le changement des palettes de bobines est effectué au moyen d'un mécanisme automatique de changement de palette qui est conçu de manière à transporter et changer les palettes de bobines remplaçables, pour rassembler les extrémités de fil et pour nouer ou raccorder celles-ci ensemble.

12. Méthode conformément à la revendication 10, **caractérisée en ce que** les éléments suivants sont présents:

- un système de préparation de palette avec le stockage des palettes préparées dans des rangées d'attente;
- une station de chargement et de retrait des palettes;
- un système de transport pour transporter les palettes préparées, qui sont placées dans des rangées d'attente, jusqu'aux cellules dans le cadre de tissage et vice versa,
- un mécanisme automatique de changement de palette (22) qui retire les vieilles palettes vides et les remplace par des nouvelles; et

- un mécanisme automatique de nouage ou de raccordement pour raccorder les vieilles bobines aux nouvelles.

13. Méthode conformément à l'une quelconque des revendications 11 et 12, **caractérisée en ce que** le mécanisme automatique de changement de palette comprend les parties suivantes:

- une partie (23) avec au moins une palette remplie;
- un partie de changement (24); et
- une partie (25) dans laquelle se rendra la palette presque vide en provenance du cadre de tissage.

14. Méthode conformément à l'une quelconque des revendications 11 à 13, **caractérisée en ce que** le mécanisme automatique de changement de palette est porté par un robot de positionnement et est commandé par un ordinateur qui régule le changement des palettes de bobines en fonction:

- du diamètre des bobines disposées sur les palettes de bobines individuelles dans le cadre de tissage ou les modules de cadre de tissage, mesuré avec l'assistance d'un système de mesure contrôlé par l'ordinateur,
- du motif du tissu Jacquard à tisser et de la consommation théorique de fil pour ce travail.

15. Méthode conformément à l'une quelconque des revendications 13 et 14, **caractérisée en ce que** pour changer une palette de bobine, le mécanisme automatique de changement de palette fait glisser la palette portant la bobine presque vide dans le sens de la largeur hors du cadre de tissage dans la partie de changement, le fil de chaîne pouvant ainsi être déroulé davantage à partir de la bobine, et il déplace subséquemment la palette presque vide dans la partie vacante (25) et la palette pleine (23) dans la partie de changement (24) horizontalement dans le sens de la profondeur jusqu'à ce que la nouvelle palette pleine vienne se positionner juste en face de la cellule, à la suite de quoi grâce à ce mouvement, le fil de chaîne est tiré dans un crochet (28), qui est relié de façon fixe au mécanisme automatique de changement de palette (22) et qui s'accroche sur l'extrémité de fil juste à proximité de l'oeillet de débit (16) dans la zone du fil de chaîne étiré horizontalement entre l'oeillet de débit (16) et le système de pinces de fil (15).

16. Méthode conformément à l'une quelconque des revendications 11 à 14, **caractérisée en ce que** pour changer une palette de bobine, le fil courant en direction du métier à tisser de la palette de bobine à remplacer et le fil de la palette de bobine de remplacement - qui est localisé avec précision grâce à une pince de fil prévue sur la palette en question

- sont amenés sous la forme d'une croix (29) avec l'assistance de crochets (26), (27) et (28) et sont tirés ensemble vers le haut dans un mouvement vertical par un ou plusieurs crochet (s) rotatif(s) verticalement mobile(s) (33) qui pivotent sous la croix des fils (29) en vue de les conduire dans des rainures respectives (31) et (32) d'un appareil de raccordement ou de nouage.

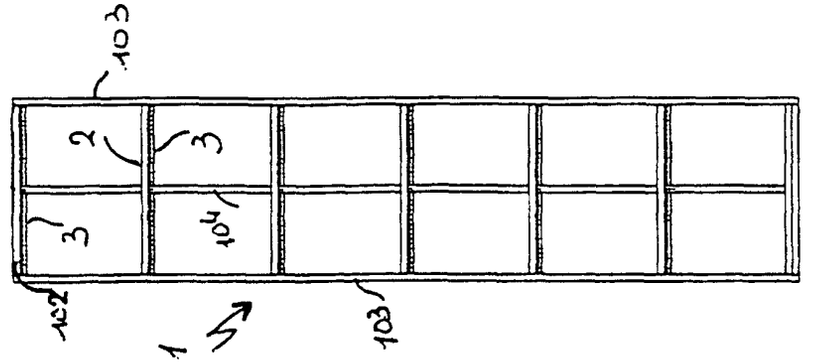


Fig.2

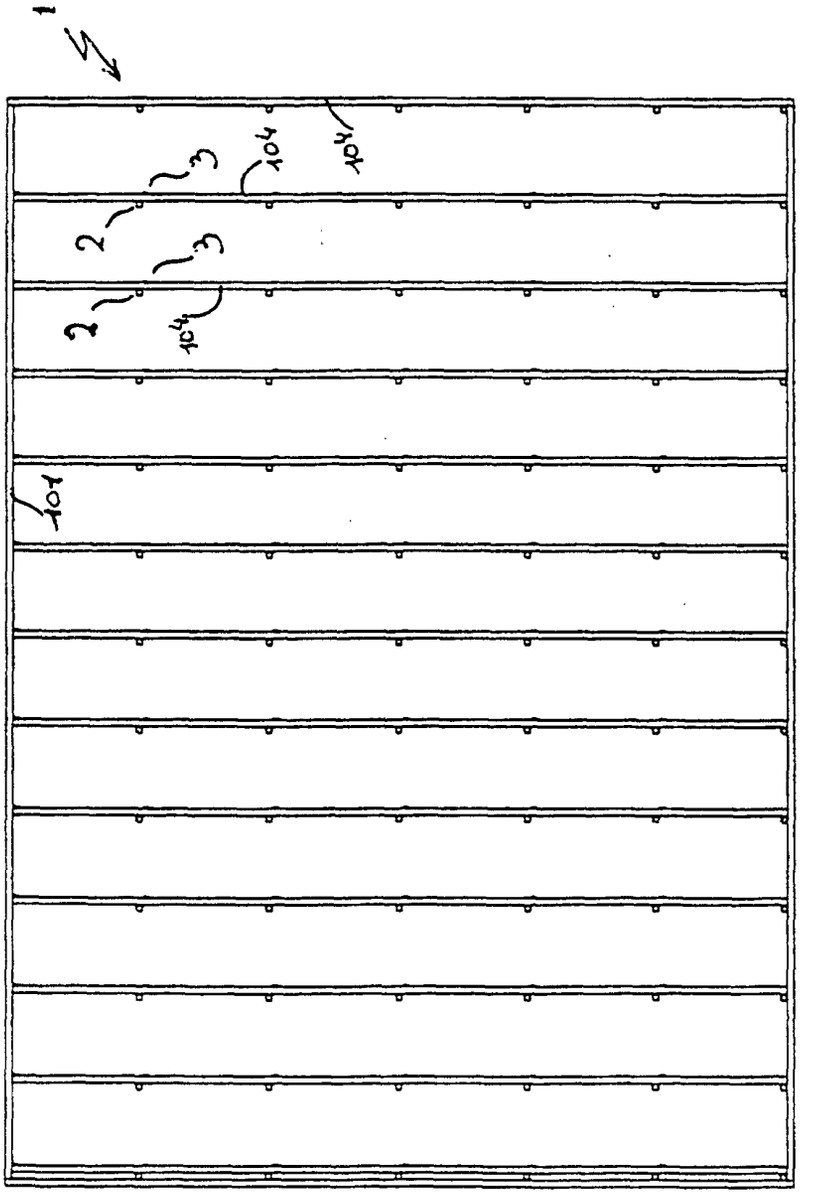


Fig.1

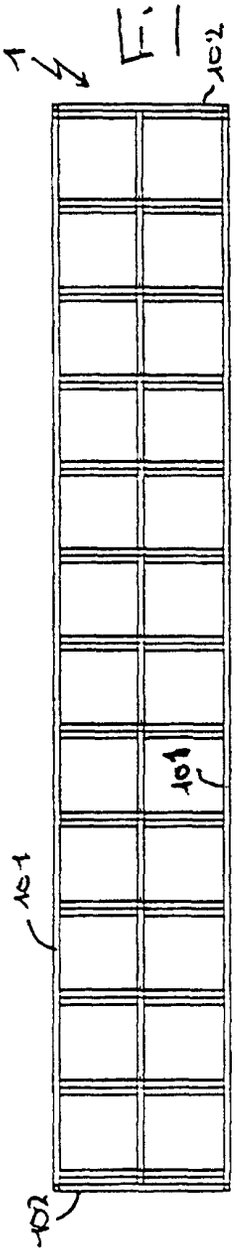


Fig.3

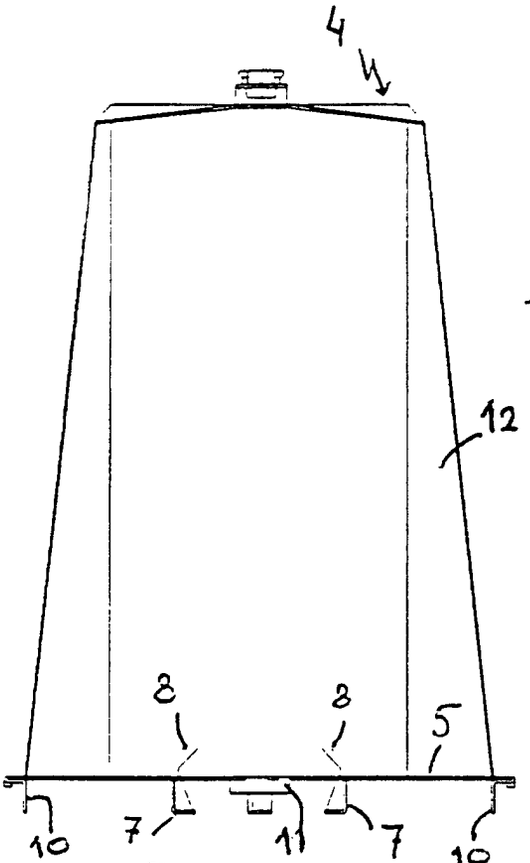


Fig. 4

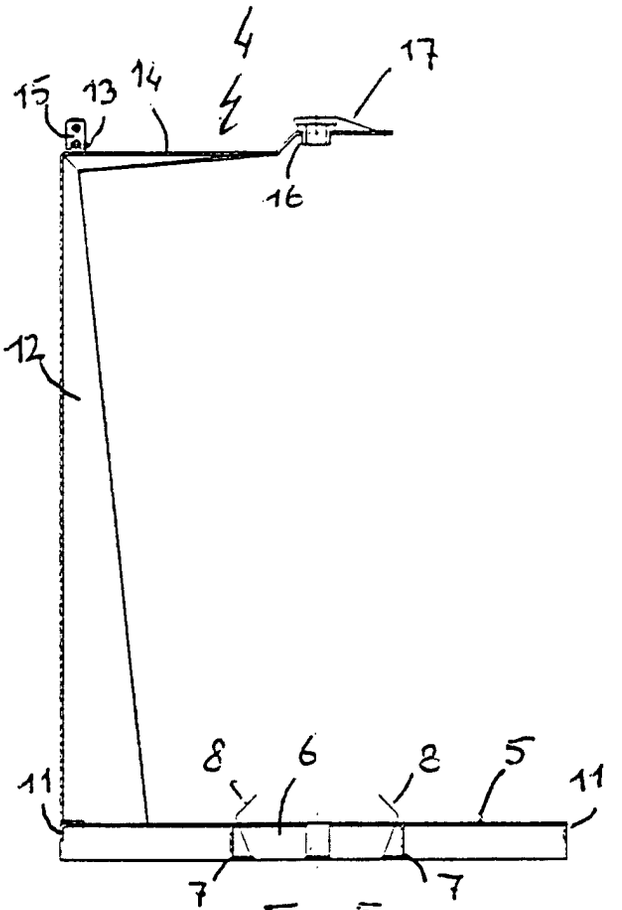


Fig.5

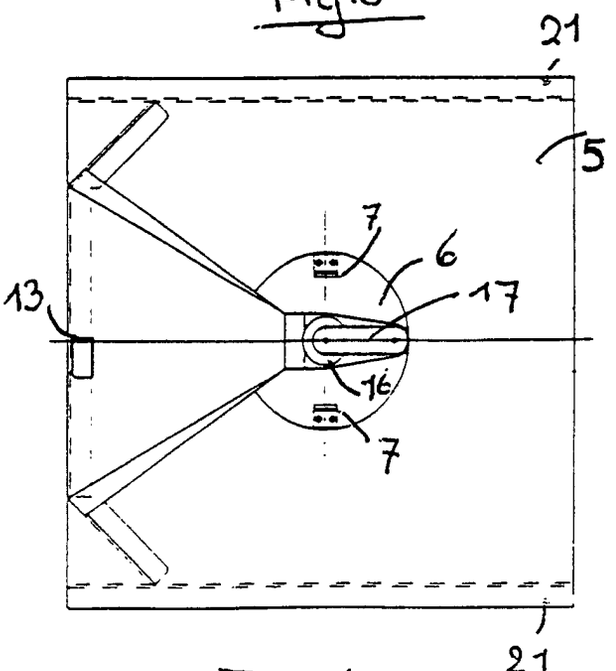


Fig.6

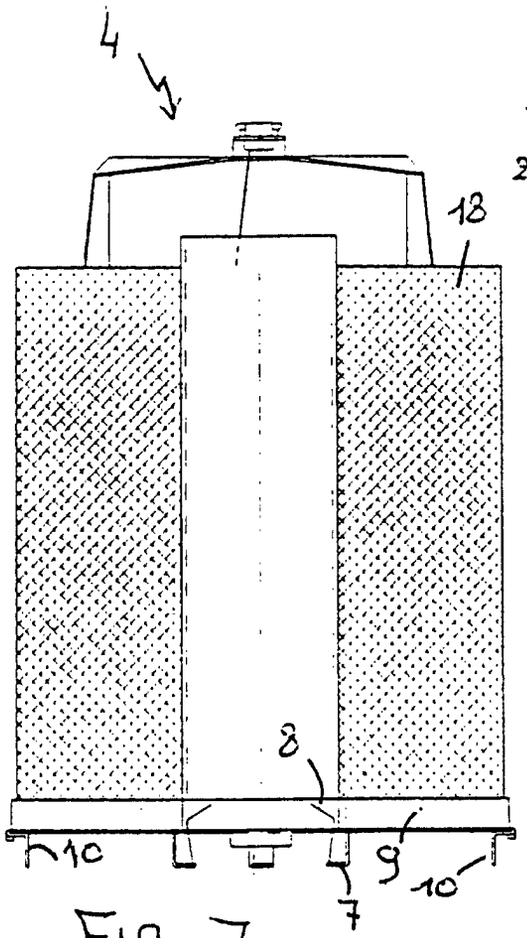


Fig. 7

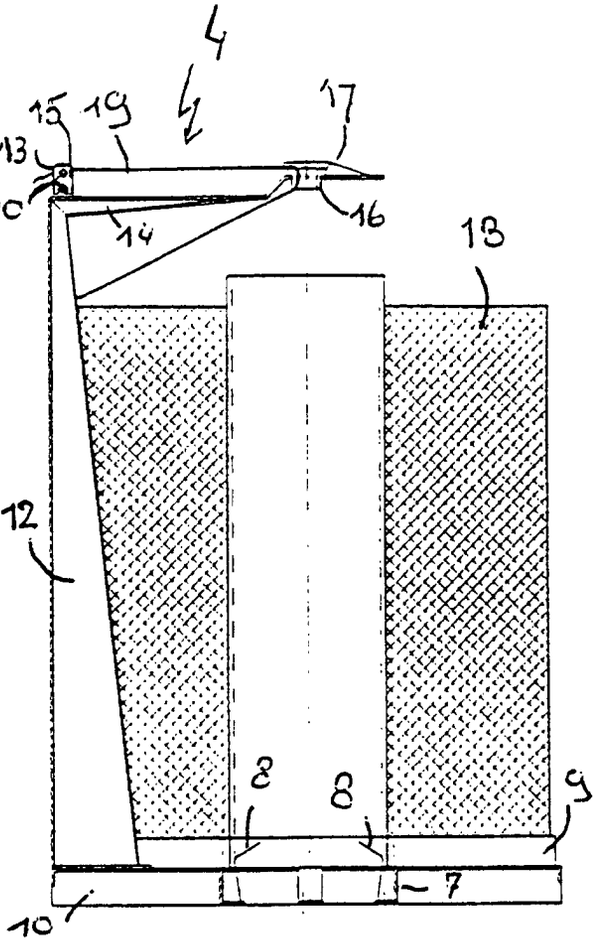


Fig.8

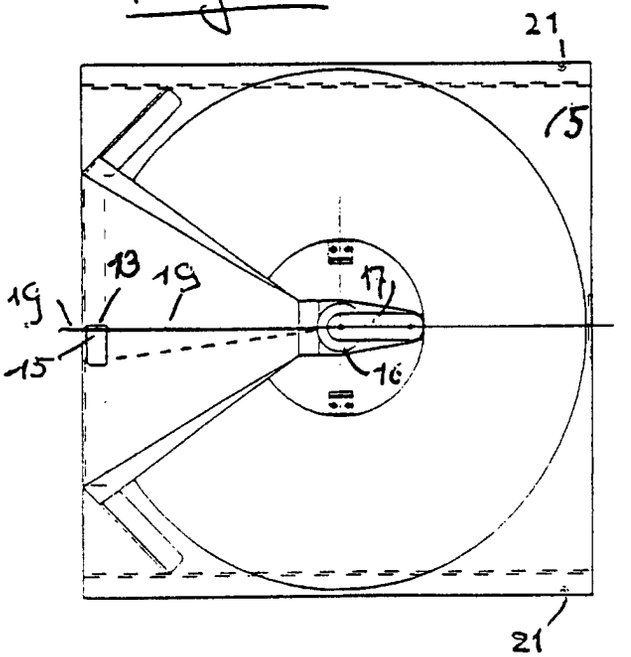


Fig.9

Fig. 10

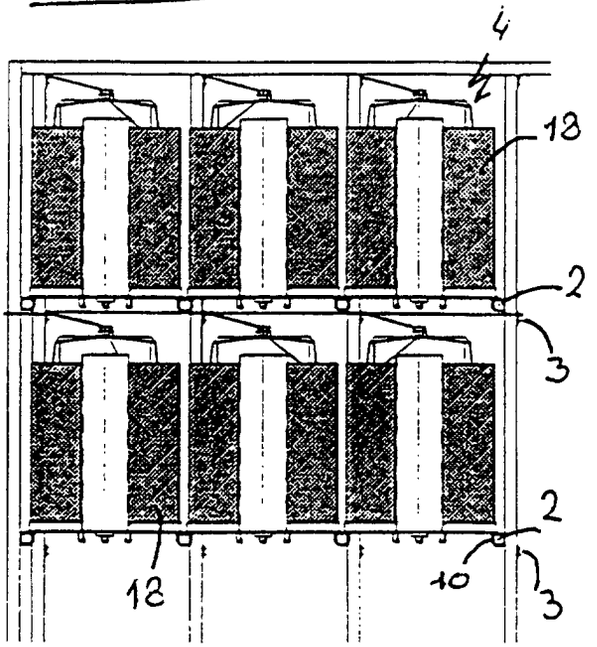
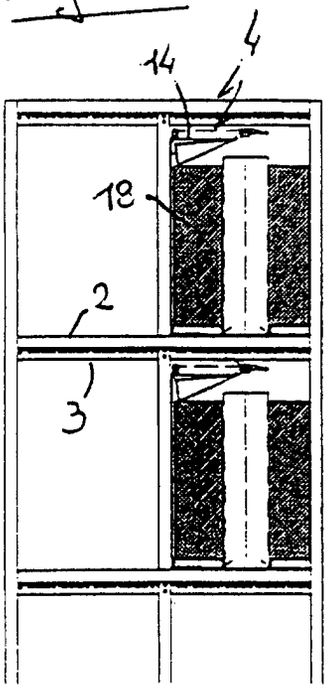


Fig. 11



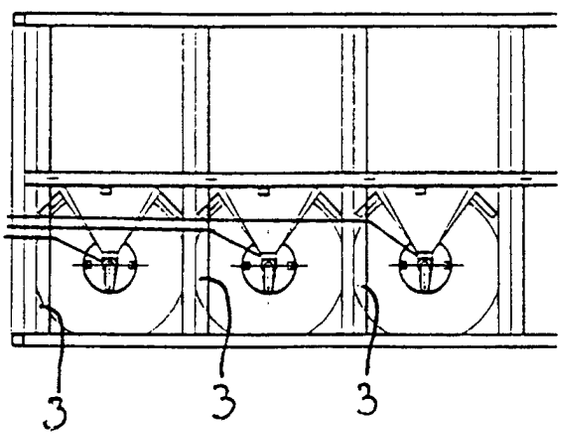


Fig. 12

Fig. 13

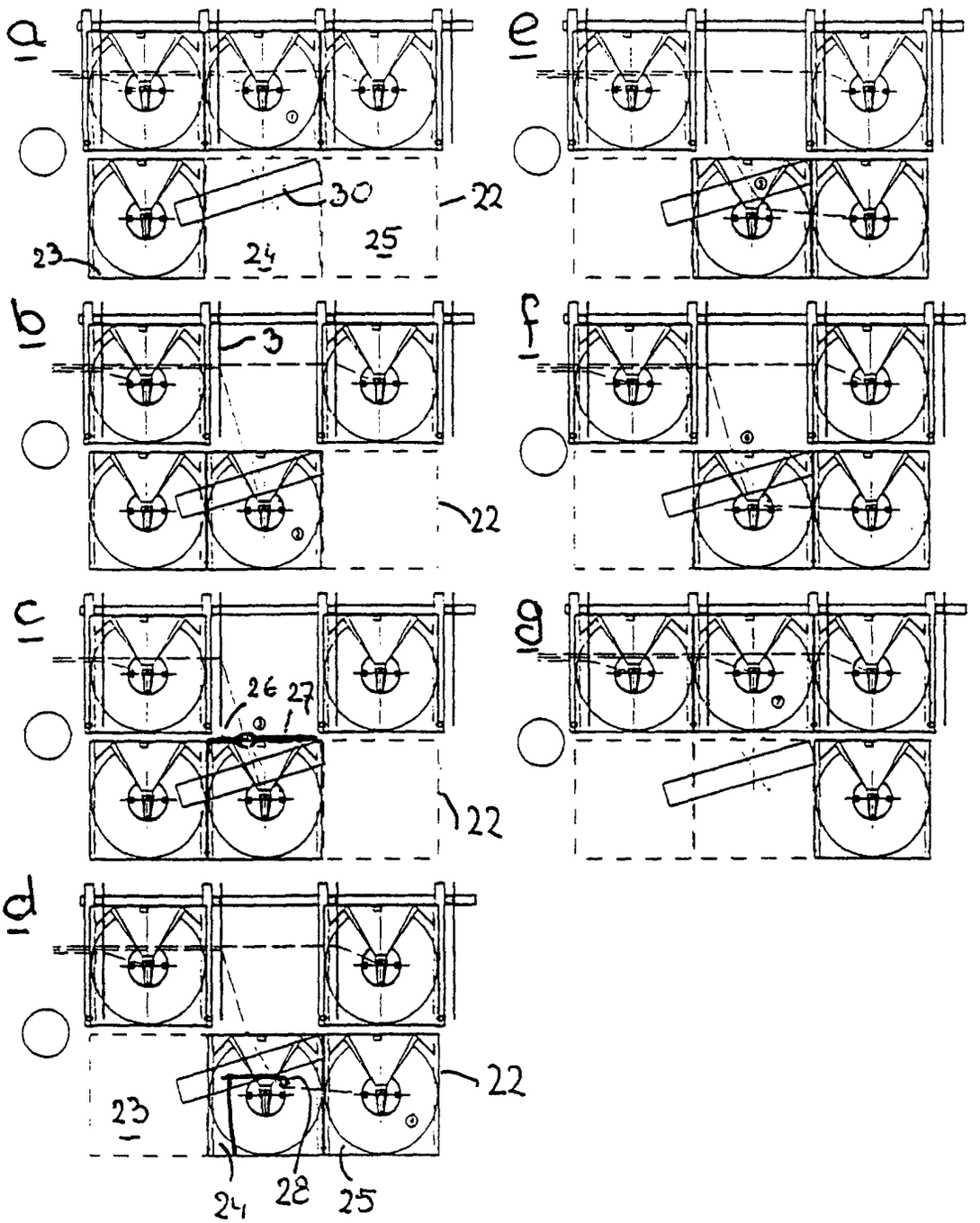


Fig.14

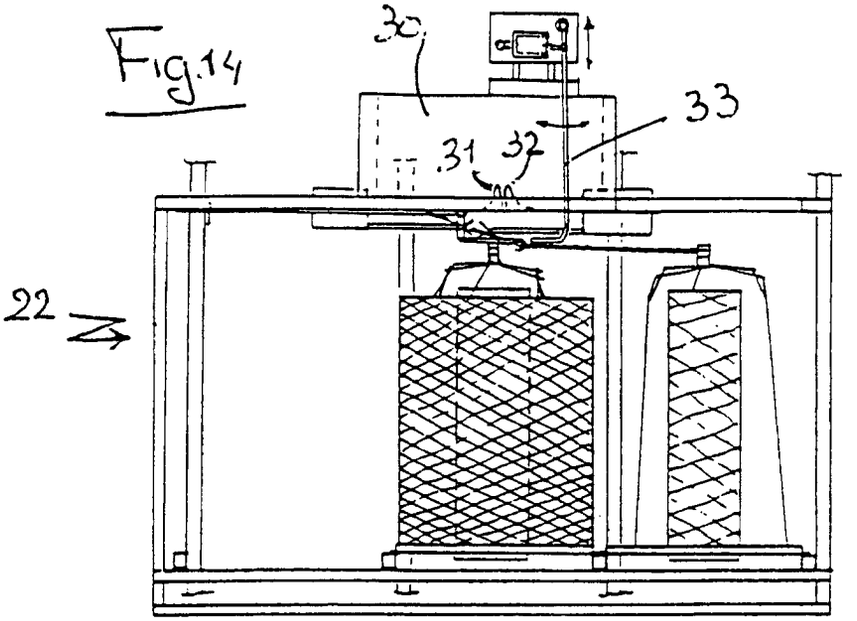
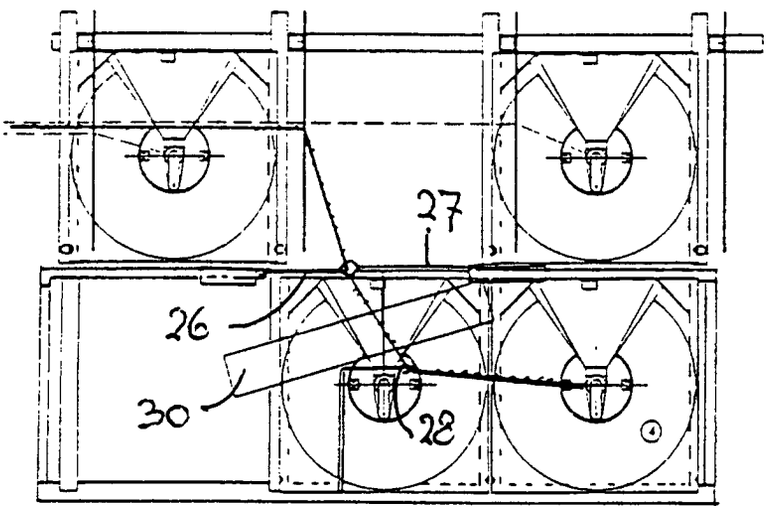


Fig 15



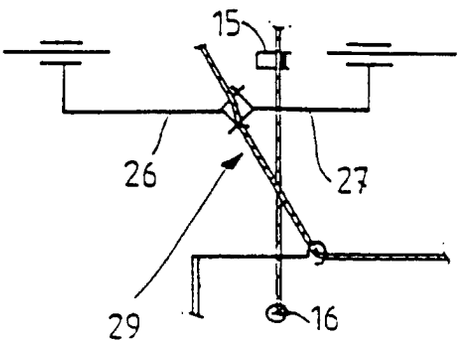


FIG. 16

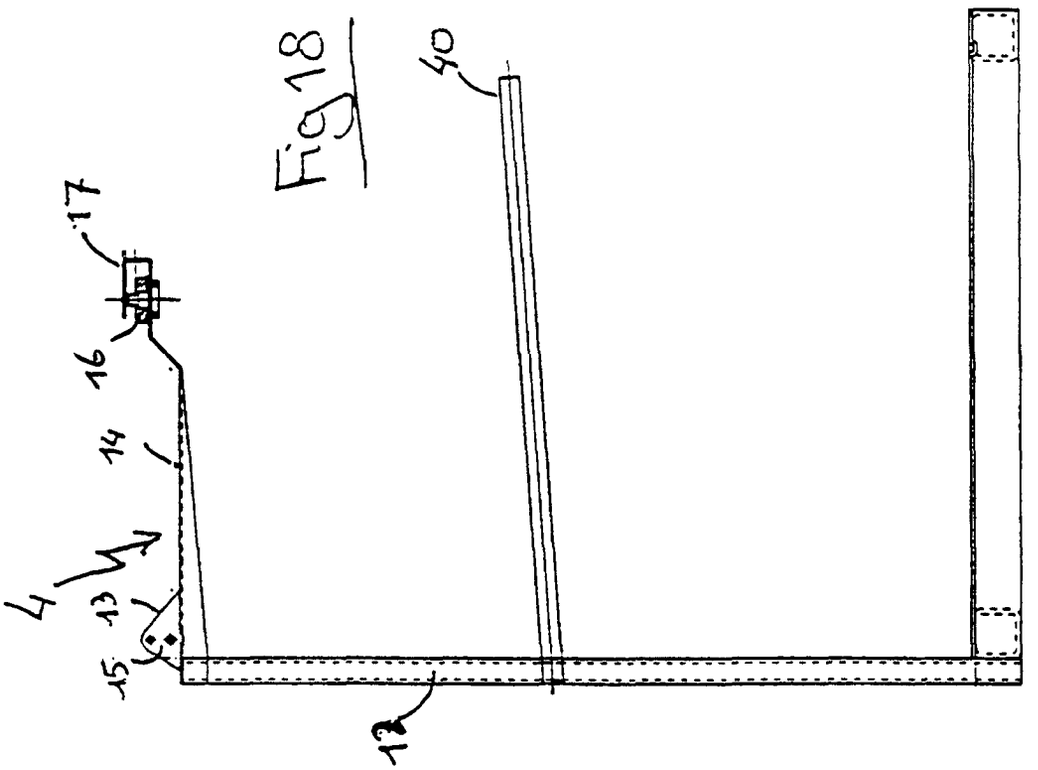


Fig 18

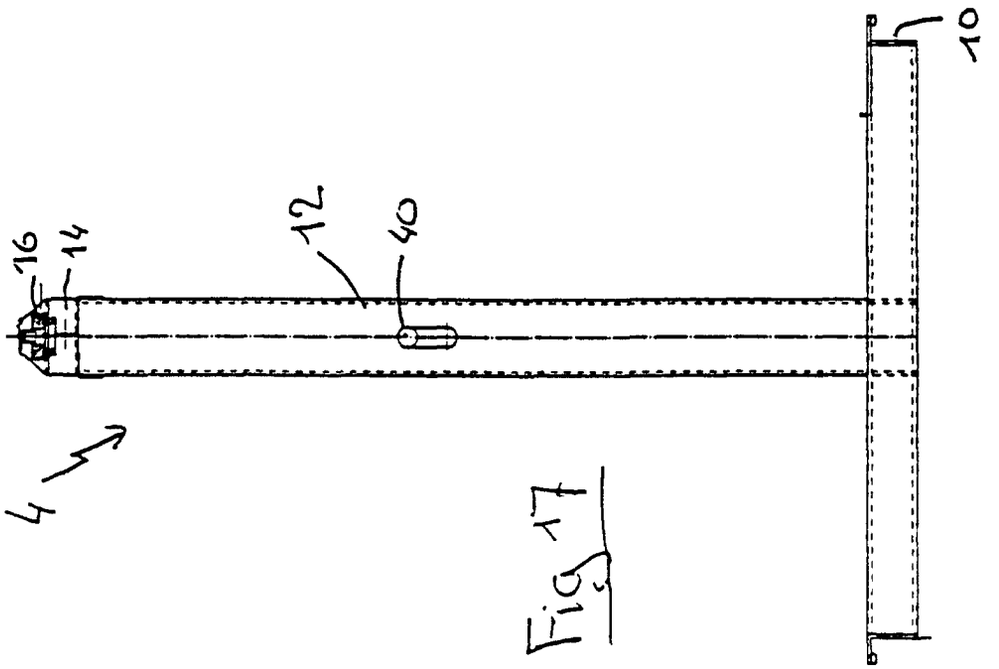


Fig 17

Fig.20

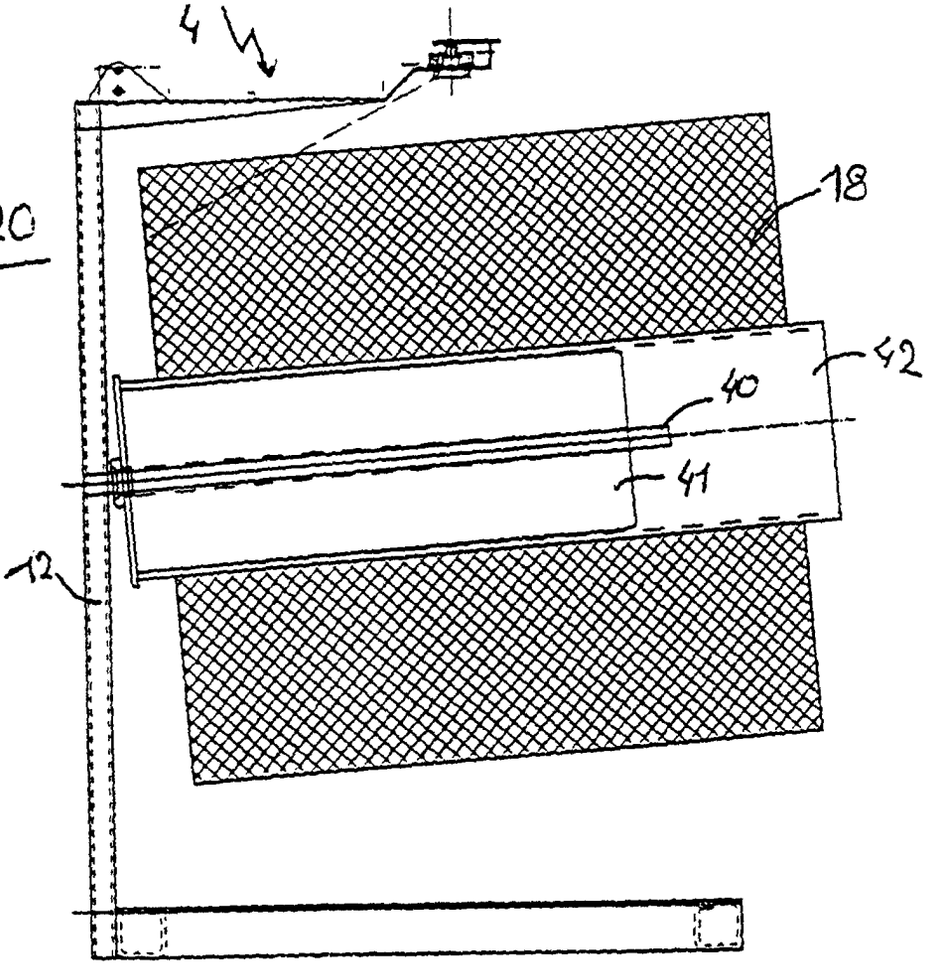


Fig.19

